RESEARCH INTO REPAIR AND IMPROVEMENT WORK OF POST OFFICE BUILDINGS BY SURVEYING AND MONITORING

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This paper analyzes the actual costs of the repair work and the improvement work of which constitute the main portions of life-cycle cost. A complete enumerative study was made of the repair and improvement work costs of the 1,255 delivery post offices throughout Japan in 2000. This paper reports that the accumulative total of the repair and improvement work costs of some buildings tends to become higher than the total of the costs of each year of many buildings in a specific fiscal year, because it reflects the improvement work costs required by the change of demands in the years buildings were used.

Keywords: repair, improvement, cost, post office

Introduction

With public works, reflecting consideration of global environmental problems and the financial conditions, there is a need to make facilities last longer and reduce upkeep and running costs. The “New action guidelines concerning the reduction of public works costs (Cabinet decision of September 1, 2000)” calls for a reduction in costs from the viewpoint of the lifecycle, thereby aiming at a reduction in overall costs. According to the new action guidelines that are being implemented from 2000 to 2008, facilities with a long life, facilities that contribute to resources and energy conservation, and facilities that harmonize with the environment are being promoted, and by improving the quality of facilities, the aim is to reduce costs and load on the environment through the lifecycle. However, there has been few detailed information about the running costs of public facilities, so it is necessary to first undertake a survey of the present conditions1−4.

In 1981, the Ministry of Posts and Telecommunications (the present Post Service Agency) began monitoring the life-cycle costs of five standard post office buildings, selected from the post office buildings completed in 1981 throughout the country. If the studies were conducted on a small number of samples, they might not represent the real trend. Moreover, the structure and specifications of post office buildings these days are different to those that were built 20 years ago, so last year an enumerative study was made of about 1,300 delivery post offices throughout the country. This paper analyzes the actual costs of the repair work and the improvement work of facilities (hereafter referred to as “repair and improvement work”) which constitute the main portions of life-cycle cost (LCC). This paper tries to grasp more accurate costs by the survey of actual expenditure than by the method to sum up the predicted costs of each building parts, which are required by periodic maintenance. This paper also challenges to understand the relationship between the chronological data of repair and improvement work costs of some buildings and the enumerative data of all buildings in a specific fiscal year.

1. Surveyed facilities

The repair and improvement work costs of all 1,255 delivery post offices owned by the government were covered in this survey (except for 26 post offices that had moved to temporary facilities in 2000 while being rebuilt), with a total floor space of 6,331,854 square meters. The number of delivery post offices throughout the country by age is shown in Figure 1, and the total floor space by age is shown in Figure 2. Less than 40 years have passed since most post office buildings throughout the country were built, and the average age is 23 years. There was an increase in the amount of postage during the period of high economic growth, which led to a lot of post office rebuilding, centered on the three largest cities, so there are many post offices with an age between 20 and 30 years.

An outline of the facilities of the five post offices, which have been monitored is since 1981, is shown in Table 1. The five facilities were the standard post offices of those days.

3. Repair and improvement work of old post office buildings

In 2000, there were 40 general delivery post offices over 40 years old throughout Japan. Except for the eight post offices in areas with slower economic development, most post offices over 40 years old had extension works during the period of high economic growth. In recent years, the age for rebuilding post office buildings is between 30 to 35 years old. On the other hand, we can also see large-scale maintenance and modernization work being carried out on buildings between 35 to 40 years old which are planned to be used continually afterwards without rebuilding.

There are six post office buildings throughout the country that are 40 years old. The Kyoto Central Post Office, one of these, underwent large-scale maintenance and modernization work in 2000 (architectural work: 840 million yen; electrical equipment work: 493.5 million yen; air-conditioning and sanitary equipment: 861 million yen), so the average value for these six post offices is high.

The Kyoto Central Post office (presently with a total floor space of 43,692 square meters) was completed in January 1971 with a total floor space of 13,723 square meters, had additions of 29,969 square meters made to it 22 years after it was newly built, in March 1983, along with rearrangement, alteration and conversion of the existing part. Furthermore, 17 years later in 2000, extensive work was undertaken, including renewal of the air-conditioning system, earthquake resistance improvement, repairs to the interior and exterior walls, installation of additional emergency electric power generators, improvement of the customer windows and lobby environment, measures for the physically handicapped, heat insulation improvement and roof greening.

The Tokyo Central Post Office was completed in 1931 (total floor space: 42,286 square meters) and the Osaka Central Post Office was completed in 1938 (total floor space: 36,688 square meters). The business overseen by the Tokyo and Osaka Central Post Offices have been moved to new, large buildings in different locations, and so they continue to be used in the style in which they were originally built. Because the Tokyo and Osaka Central Post Office buildings are large, the work cost per unit floor area is small. For efficient office work, generally, several items of repair and improvement work are ordered to be done together, but with regard to the Tokyo and Osaka Central Post Offices, most of the work is ordered as it becomes necessary, with an average of one item of work being done each day. It is thought that this is influenced by the fact that both these post offices are large organizations with over 1,000 workers, and they are able to handle the ordering of detailed building and repair work. As shown by the fact that no neutralization of the concrete frame of either of these buildings has progressed, it is thought that these buildings were originally built with a high quality and have been maintained with continuous detailed upkeep, which has led to not so large repair work costs even as the buildings have aged.
4. Comparison of the repair and improvement costs of the monitored five post offices and those of the surveyed post offices

Figure 5 shows the changes in total repair and improvement costs per square meter with age for the post offices where LCC are being monitored. In 1988, the Ministry of Posts and Telecommunications began an eight-year plan to renewal work and expansion of customer windows and lobbies of post offices throughout Japan that were owned by the government. The reason why the costs are high between the 10 and 15 years after completion is because renewal work and expansion of customer windows and lobbies was carried out at post offices throughout the country during this period.

Figure 6 shows the accumulation of the repair and improvement work cost per square meter for 20 years after the facilities' completion. The accumulative total of the repair and improvement work costs (adjusted to 2000 prices) of the five post offices where the life-cycle costs are being monitored since 1981 amounts 54,820 yen per square meter in 20 years (2,741 yen per square meter per year). The total of the average costs for repair and improvement work of the 1255 post offices in 20 years after their completion amounts 45,560 yen per square meter in 20 years (2,278 yen per square meter per year). The average costs of monitored five post offices is 20% higher than that of 1255 post offices all over the country, because the former reflects the costs of the improvement work of the customer windows and lobbies that were conducted when they were between 10 to 15 years old.

Figure 7 also shows the accumulative total for repair and improvement work costs per unit floor space for 1,255 post offices for fifty years after their completion. From Figures 7, we can see that the total of the repair and improvement work cost of 50 years after the completion is about 250,000 yen per square meter. In the 2000 fiscal year, no nationwide facilities improvement was implemented. Therefore, it is thought that the costs which the nationwide investigation shows are equivalent to the minimum necessary of the repair and improvement costs. Although there is no change in the use of a post office, we need to improve the facilities in order to respond to the demand which was not expected when they were designed. It is always difficult to predict the future improvements beforehand. The difference between the costs of the five monitored post offices and the costs of the nation wide survey can be understood that it is caused by the unpredicted improvement works. We must be aware that this difference is reflecting the change of a demand level for the buildings in the period of investigation, and that it may not continue to be at the same level in the future.

Cost per square meter of floor space (’000yen/m²)

Cost (yen/m²)

Figure 5 Changes in total repair and improvement costs per square meter with age for the five post offices where the life-cycle costs are being monitored

- Odate, ◇: Shimozuma, △: Kasai, ○: Tamagawa
- □: Miyakonojo, ○: Average for 5 post offices

Figure 6 Accumulative total of repair and improvement work costs per unit area (1) up until buildings are 20 years old (comparison with monitored post offices 2)

Figure 7 Accumulative total of repair and improvement work costs per unit area up until buildings are 50 years old

- ①: total of repair and improvement work
- ②: improvement work
- ③: repair work
5. Breakdown of repair and improvement work

Figure 8 shows the breakdown by item of repair and improvement work, based on the name of the work ordered. The name of the work is only used to represent the complete content of the work, and generally, most work includes other work not indicated by the name. "Building" forms 30.1% of the whole.

61% of "Building" is classified as "Overall Building" (Table 2). Figures 9 to 14 show the relationship between repair and improvement work cost, and age, by "architectural" sections such as the roof, exterior walls, exterior fittings, interior ceilings, interior walls, interior floors and interior fittings. The repair and improvement work cost of the roof increases as years pass (Fig. 9). Usually, the waterproofing sheet is covered over the existing deteriorated asphalt waterproofing which is deteriorated in order to reduce the construction cost and time. It seems that the costs for repair increases as the deterioration spreads as time passes.

There are three post offices which are 44 years old in Japan. One of these is the Urawanaka Post Office which has a 679-square-meter floor space and was refurbished its exterior and interior walls in 2000, spending approximately 37 million yen for it (Figure 10 and 12). That causes the high value for the 44th year. We must remind that these costs include the costs for other items ordered under these items. From Figure 13, we can see the costs for interior floor repair increases according as the years past. The repair and improvement work for exterior fittings occurs at an earlier stage than that for the internal fittings (Fig. 11, Fig. 14). The costs for the repair and improvement of exterior fitting are higher than that for interior fitting because it includes the heat insulation improvement work of fitting and also larger deterioration was caused by severe outside climate. Since more than 60% of construction work is included in the item of "Overall Building", the costs shown in Figure 9 to 14 are not all the costs relevant to each item. Nevertheless, it can be said that these figures are expressing the characteristics of the repair and improvement work of each item.

6. Conclusion

We found that the repair and improvement work costs of posts offices spent in several decades after completion is almost equal to the initial construction cost, which is approximately 220,000 yen per square meter. The accumulative total of the repair and improvement work costs of some buildings tends to become higher than the total of the costs of each year of all buildings in a specific fiscal year, because the former reflects the improvement work costs required by the change of demands in the years buildings were used. It is also proved that the yearly work cost divided by the total floor space in a specific year and the simple average for the repair and improvement work costs per unit floor space of each year are not the same. Therefore, we must remind ourselves that some differences could be seen in the calculated costs due to how data is surveyed and computed.

When conducting a monitored survey over a long period of time about standard offices, an enumerative investigation of all institutions conducted periodically is useful to find the deviation of the monitored data from the total. Post office buildings are designed and maintained in the almost same specification but there is some variation in the repair and improvement work costs between facilities. This paper equalized the costs without considering the variation between each facility, but I would like to develop my research further by considering the variation in data to estimate the costs more precisely.
Figure 9 “Roof” repair and improvement work costs per unit area by age

Figure 10 “Exterior walls” repair and improvement work costs per unit area by age

Figure 11 “Exterior fittings” repair and improvement work costs per unit area by age

Figure 12 “Interior walls” repair and improvement work costs per unit area by age

Figure 13 “Interior floor” repair and improvement work costs per unit area by age

Figure 14 “Interior fittings” repair and improvement work costs per unit area by age

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和文要約

本稿はライフサイクルコスト（LCC）の主要な部分を占める施設（建築、設備）の修繕工事、改修工事（以下、修繕・改修工事と呼ぶ）の費用について、全国の郵便局の実態調査を元に考察するものである。

はじめに

郵政省（現郵政事業庁）では昭和56（1981）年度に全国で竣工した郵便局庁舎のうち、標準的な5つ郵便局庁舎についてライフサイクルコストの追跡調査を実施している。近年の郵便局の構造、仕様は20年前とは異なるので、約1300局ある全国（集配）普通郵便局の皆様を含む、特定の建物の修繕・改修工事費の経験データと、経年が相違する多くの建物における特定年度のデータの関係について分析を行っている。本稿は既往の研究に多く見られる、部位ごとの修繕費と修繕周期の想定にもとづくコスト算出手法より、より実用に近いコストを把握することを目指している。

1. 調査対象

今回、調査対象としたのは、国が所有する（集配）普通郵便局全局（平成12年度に竣工した郵便局のうち、現面積をもとに計算した施設を除く）2278局（総延床面積1,231,168m²）の修繕・改修工事である。全国の集配機能を有する普通郵便局の経年別のデータを図1に、経年別の延床面積を図2に示す。全国の郵便局庁舎のほとんどは建設後の延床面積が40年以内であり、経年の単純平均値は23年である。

1981年度以降追跡調査を行っている、5の調査対象郵便局の施設概要に示す。5の郵便局は当時は、標準的な鉄筋コンクリート造の庁舎であった。

2. 全国の郵便局の経年と修繕、改修工事の関係

図3には平成12年度における全国の普通郵便局1255局の修繕工事と改修工事の合計工事件数を局数の経年との関係で示す。修繕、改修工事の主な内容は①経年劣化に対応する修繕工事（例：外壁塗装、床面塗装、外壁物をトラックに積み込む発着窓の改修、戸建窓塗装など）、②業務に対応した改修工事（例：業務用のペーパー搬送機の設置、通信機室設置、地下室整備、各種客室設備向上のための工事（例：窓対応の拡張・リニューアル、キャッシュサービスコーナーの設置など）で、

図4は単位床面あたりの修繕、改修工事の合計金額を局舎経年との関係で示している。「単位床面あたりの工事費」は、当該年次の工事費をその年度で該当する局舎の延床床面積で除したものである。各経年（データが存在する年度のみ）における単位床面あたりの修繕・改修工事費は平均4,896円/m²である。図4から、①単位床面あたりの修繕工事費、改修工事費については経年40年目頃まで増加傾向であること、②経年11年目、23年目に小規模なピークを、経年35〜45年以上に大きなピークを示すこと、③一方経年40年以上の局舎の単位床面あたりの修繕工事費、改修工事費はそれほど大きくないことが読みとられる。

3. 経年の進んだ施設の修繕・改修工事の特徴

平成12年度において、経年40年以上に集配普通郵便局は全国に40存在した。経済発展の速度が速い地方に存在した8の郵便局を除き、経年40年以上の郵便局の多くは高度経済成長期に集積されている。建物の対象となる郵便局舎の経年は、近年では30〜35年程度であるが、継続して使用する局舎に対しては、35〜40年経過した時期で大規模な保全工事を行っている。

4. 業務調査に基づく調査の修繕・改修費との比較

図5はLCC調査局の修繕・改修工事費の履歴を示している。ピークは、1988年度から8か年計画で実施された、全国の郵便局の窓口ロビーの拡張、リニューアル工事を反映している。

図6は、単位面積あたりの修繕・改修工事費の竣工後20年までの累計金額を示している。「LCC追跡調査を行っている5つの郵便局の修繕・改修工事費の20年間の累計金額は3,842円/m²（年あたり77,247円）であり、全国の郵便局の1年目から20年目までの経年の修繕・改修工事費の累計金額は455,000円/m²（年あたり22,780円）である。金額の差は1988年度から8か年計画で実施された窓口ロビーの改修工事に起因している。図7は、全国2,255局の郵便局の各定期における単位面積あたりの修繕・改修工事費の1年目から50年目までの累計金額を示している。

追跡調査を行っている郵便局の工事金額と、全国調査の工事金額の差は、設計当初に予想が困難である改修工事の金額に相当すると理解することもできる。ただし、この差額は、調査対象期間における建物への要求水準の変化を反映しており、今後もこの水準があると断定することはできない。

5. 修繕・改修工事の内訳

図8は、発生工事金額を元に区分した、修繕・改修工事の項目別内訳を示す。「建築」は、全体の30.1%を占めている。図8における「建築」の細目比率を表2に示す。「建築」の61%は「建築一式」として区がされている。図9〜14は「建築」のうち、屋根、外壁、外壁部、内壁、内壁、内壁、内壁として区分された修繕・改修工事費を経年との関係で示している。屋根の修繕・改修工事費は経年とともに増加傾向にある（図9）。経年44年目までの郵便局は、全国に3局存在する。そのうちの1局において、2000年までに内壁、外壁の大規模改修工事が行われたため、図10、図12において44年目の数値が大きくとなっている。建物内の部の修繕、改修工事については、経年が浅い時期の工事があり、年数とともに工事単価も大きく傾向が見られる（図13）。外壁建具は内部建具より早期に修繕改修工事が発生している（図11、図14）。外壁建具は、外部環境への劣化による加え、建物の断熱改修工事を実施していることも影響し、内部建具より工事単価が大きい。

まとめ

郵便局舎の新築工事単価は22万円程度であるので、竣工後約70年間、新築工事費とほぼ同額の修繕・改修工事費が必要であることが分かった。標準的な局舎の長期間に渡る追跡調査の結果は、施設に対する要求条件の時代変化を反映するため、ある年度の経費の差異調査結果より高額になりかねない。標準的な局舎を対象とし長期間に渡って追跡調査を行う場合においても、定期的に全施設の修繕調査を行い、追跡調査の結果と施設全体の傾向の差を確認することが有効と考えられる。

同じ設施で設計され、保守管理されている郵便局においても、個々の施設の修繕・改修工事費には「ばらつき」とも見られる。本稿、個々の施設の工事費を平均化して取り扱うが、今後はデータの分散状況も考慮した研究へと発展し、より正確な修繕・改修工事費の予測手法を開発することにしたい。

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